ANALYSIS OF CRP SAGEBRUCH PLUG PLANTINGS COMPLETED IN SIGN-UPS 20-21.

FRANKLIN AND ADAMS COUNTIES, WASHINGTON
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SUMMARY:

- Plant survival varied with supplier. Self-grown plants had excellent survival levels. Survival differences between Bitterroot Nursery plants and Plants of the Wild plants were not significant.
- Root development of container grown plants was minimally sufficient to support plants growing in harsh environments.
- Competing vegetation was the most important factor effecting sagebrush plant survival. Dense stands of cheatgrass were especially detrimental.
- Spring plantings should be completed prior to March, and fall plantings should include cheatgrass control.
- Survival differences between Franklin and Adams counties were comparable.

INTRODUCTION

The Conservation Reserve Program in Washington State allowed producers to either seed or transplant live shrubs into their bid acres. Many producers opted for the transplants because they believed that seeding sagebrush was too risky. Several million sagebrush plants were transplanted in the drier regions of Washington.

The majority of the sage plants were grown in 4 cubic inch “Pine Cell Conetainers”. These generate ‘plugs’ with 6-inch long root systems. Sage plant suppliers followed good greenhouse management and used good genetic stock. The plantings occurred during periods when temperatures were low and evaporative losses were minimal. Unfortunately, survival has been sporadic. The Pullman Plant Materials Center investigated this issue and the results are provided in this report.

METHODOLOGY

Mark Stannard visited the Adams and Franklin county field offices and randomly selected CRP 20 and 21 sign-up contracts with sage plantings. An equal number of fields were visited in each county in late-spring 2003. NRCS Conservation notes in the contracts were used to determine planting dates, supplier, and who installed the planting. Soils data were compiled from soil surveys and weather data were compiled from Washington weather station reports. Additional information was collected as field notes and is used as supporting data.

A pin was randomly placed in plantings, and all the sage plants within a 14-feet radius of each pin were counted. This amounts to 630 sq. feet per point. The average height was estimated as well. Since planting density varied with each planting, it was decided that a full planting consisted of at least 20 plants per 630 sq. feet. Consequently, ten plants equate with a 50% survival level.

Several dead plants and several live plants were excavated, and the root:shoot ratios were visually compared. Live plants were replanted and watered.

RESULTS

The overall survival of all the plantings evaluated was 64% (12.8 live plants per 630 sq. feet). Eight out of 90 sites were complete failures. Twenty-one out of the 90 sites were complete successes (100% survival). Two-thirds of the plantings had over 50% survival levels.

Regression analysis of 4 factors (Precipitation received 120 days prior to planting, Precipitation received 120 days post-planting, Supplier, and Competing Vegetation) accounted for 62% of the variability in plant survival. The remaining 38% of the variability was unaccounted for but probably included factors such as planting date, growing degree days following planting, and prolonged summer drought conditions.

Individual factors are considered below.

Plant Size:
Research conducted by the Pullman PMC at several eastern Washington sites has shown that long root systems provide excellent dryland survival levels because the long root systems (>6-inches long) are far less prone to surface soil desiccation. The plugs that were evaluated in this study had appropriate root lengths and root:shoot ratios. The bare-root, self-grown plants had approximately the same root length but probably had more lateral root development. Container grown plugs had poorly defined lateral roots.

Supplier:
Plants of the Wild was the predominant supplier in both counties. Growers acquired Plants of the Wild plugs either directly from the nursery or purchased them from Connell

Grain Growers. Bitterroot Nursery was the second largest provider and they also provided their own planting crews. One grower grew and transplanted his own sage plants.

Mean survival rates were 47, 65, and 100% for Bitterroot Nursery plants, Plants of the Wild plants, and self-grown plants, respectively. Survival of self-grown plants was significantly greater then the commercial plants ($P > 0.001$). Survival differences were insignificant between Bitterroot Nursery and Plants of the Wild plants

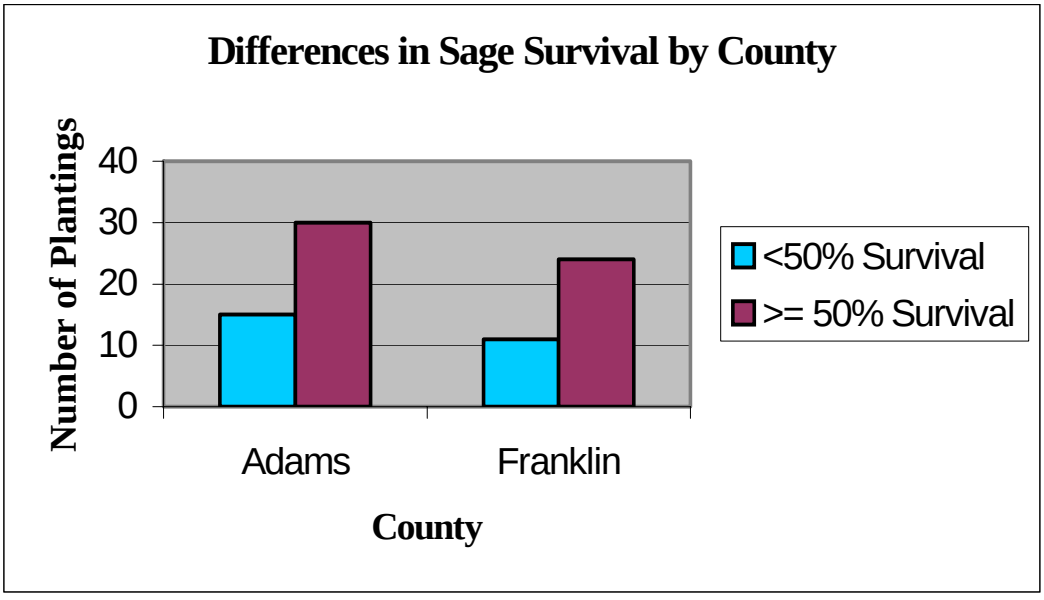
The lower survival rate for Bitterroot Nursery plants is partially attributed to lower precipitation regime and heavy weed competition.

One hundred percent survival of the self-grown plants can be attributed to a few factors. First, the grower had more stake in the planting and made a better effort then other CRP participants. Second, the bare root plants had copious lateral root development and may have improved survival.

Site Preparation and Planting technique:
Only the self-grown plants were machine-planted. A tractor-drawn, single-row tree planter opened the soil and bareroot plants were placed in the opened soil. Each plant was visited shortly afterwards and tamped to ensure good soil:root contact.

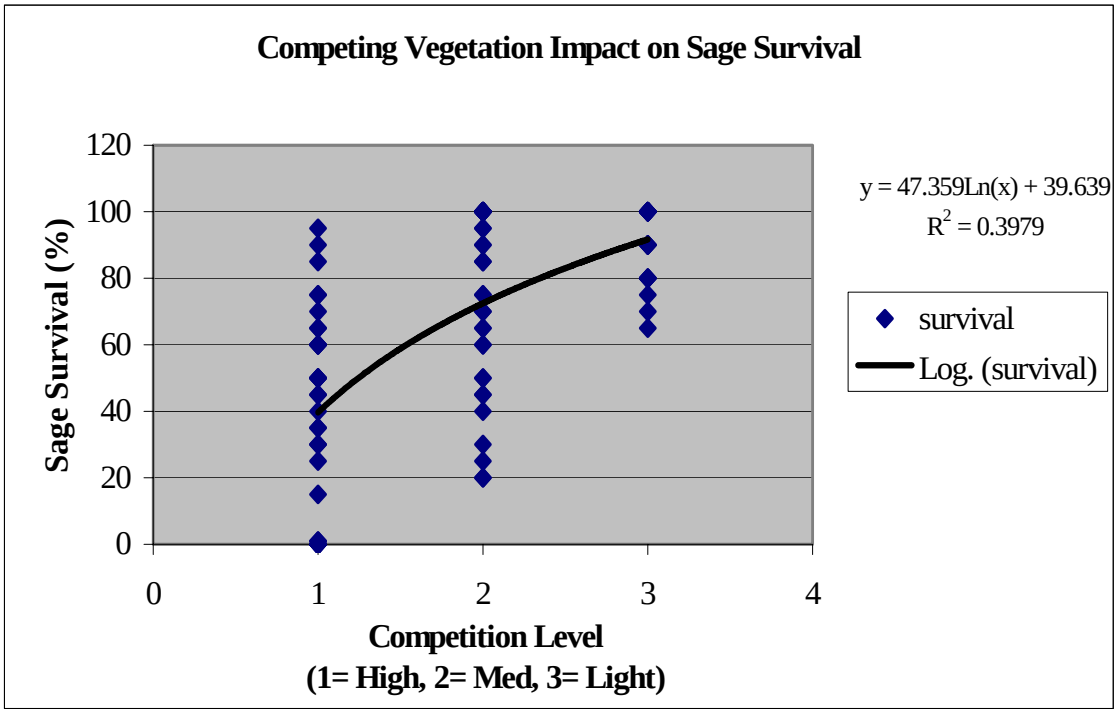
All other plantings evaluated in this study were hand planted. Site preparation consisted of scraping a small area (< 2-sq. ft.) for each plant with a hoe-dad. The soil was opened up with the same tool and the plug was properly planted. J-rooting, exposed crowns, air pockets, and other poor planting practices were uncommon.

Location:
Survival differences were not significant between Adams and Franklin county plantings ($P= 0.218$). Both counties had roughly twice as many plantings with over 50% survival then plantings with less then 50% survival.



Competing Vegetation:
Competing vegetation was categorized as High, Medium, or Light. **High competition** consisted of either very dense stands of cheatgrass, fiddleneck, or aged CRP grasses with dense cheatgrass understory. Weed control was also nonexistent. **Medium competition** consisted of 1-2 plants/sq. ft of established CRP grasses. Cheatgrass was largely absent. Weed control consisted of minimal scalping. **Light competition** consisted of either newly seeded CRP cover or total weed control around each plant.

Competing vegetation was the most important survival component of all the factors analyzed. Mean survival varied from 39, 74, and 90% for High, Medium, and Light competition, respectively. Regression analysis indicated that competition effects were not linear correlated with survival (see Figure).

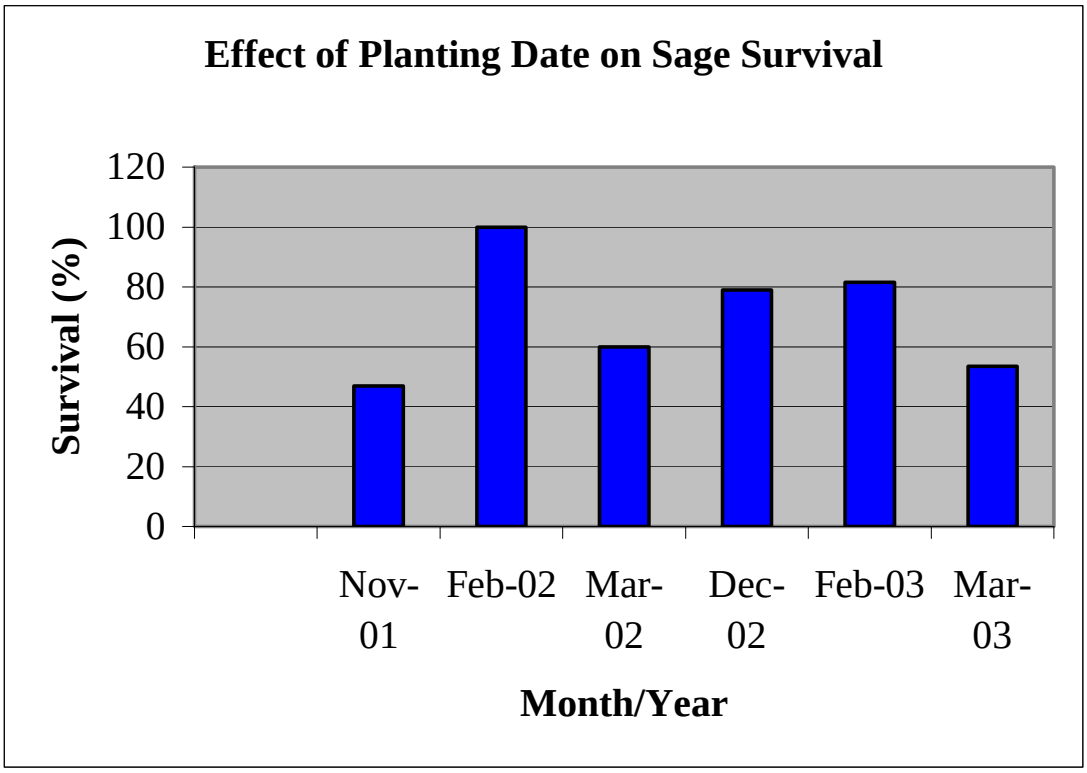


Precipitation:
Precipitation received 120 days prior to planting and 120 days after planting was estimated using local weather station records. Precipitation prior to planting varied from 1.82 to 6.06-inches. Precipitation received 120 after planting varied from 1.09 to 6.60-inches. The 240-day accumulation varied from 3.72 to 10.26-inches. Survival was poorest at 3.72-inches of 240-day precipitation. Survival was not greatest at the highest precipitation. This can be attributed to a concurrent increase in competing vegetation. However, if we consider a 50% survival level as a "fully successful planting" then we find a correlation between "success and 240-day precipitation".

Planting Date:
Planting date is a qualitative factor so each planting date was assigned a treatment number and survival was compared using ANOVA. Survival varied significantly with planting date ($P < .001$).

The December and February plantings fared very well with better then 79% of the plants surviving. Survival of the March 2002 & 2003 plantings was adequate but not as great as the prior mentioned plantings. The poor performance of the March plantings can be tied to a combination of factors. First, cheatgrass and conservation grasses are active in March and April, and they use moisture in the upper soil profile at this time of the year. Second, transplant shock is inevitable and it may take a few weeks for the plants to adjust to the new environment before active growth commences. Prolonged storage of plugs destined for March plantings was considered but eliminated as a possible factor because suppliers did not store plugs in conventional dark-cold storage. They pulled the plugs immediately prior to shipping.

Several plantings occurred in November 2001. Survival varied but overall it was quite poor. Complete failures were observed in a few of these fields and can be attributed to grass stand failure and intense cheatgrass competition.



Soil:
There were no significant differences in survival that can be attributed to differences in surface soil texture.

CONCLUSIONS

Survival was highly variable and cannot be tied to any single factor. Rather, survival is tied to a combination of many factors. Fortunately several factors are in control of the grower and NRCS.

First, larger plugs (10 cubic inch root systems) would improve lateral root development and should be considered for future plantings. The Pullman PMC uses 10 cubic inch stock for most of its dryland plantings and survival customarily exceeds 90%. The cost of 10 cubic inch plugs will be roughly twice as expensive as the standard 4 cubic inch plugs. There should be no differences in planting costs. Bareroot stock has demonstrated excellent survival. The NRCS should develop guidelines for producing and managing bareroot sagebrush stock.

Second, better control of competing vegetation must be exercised. A study completed by Courtney Smith and Mark Stannard (results published in 2000 SRM abstracts) demonstrated the value of thorough vegetation control in first year dryland shrub plantings. Waiting until March provided marginal benefits because much of the upper soil moisture was already depleted. Fall plowing strips provided the greatest benefits. This reduced competition and the dark soil surface warmed sooner in the spring then unturned soil.

Third, late fall plantings require follow-up weed control because late flushes of cheatgrass are extremely competitive. Application of a residual herbicide at planting may be an option. This option was employed by Northwest Transplanters with outstanding success.

Fourth, demonstration plots should be established in counties with high CRP enrollment to show the differences in pre-plant and post-plant weed control provided by registered herbicides and tillage practices. The results should be published as either a NRCS Technical Note or a WSU Extension Publication. The results should also address the economics of each practice.